Unit 15
Day 2
The Remainder Theorem

Remainder Theorem: If the polynomial P(x) is divided by x-k, the remainder is P(k)

$\div (x+5)$

1) $P(x)=x^3+8x^2-5x-84$ $\cancel{x}=-5$

-5	1	8	-5	-84
		-5	-15	100
	1	3	-20	16

$P(-5)=16$

$P(-5)=(-5)^3+8(-5)^2-5(-5)-84=16$

For each polynomial, use the remainder theorem and synthetic division for fint f(k).

2) $f(x)=2x^3+3x^2-8x-12$ $k=-2$

$\div(x+2)$

$$f(-2)=2(-2)^3+3(-2)^2-8(-2)-12$$
$$=0$$

$$\begin{array}{r|rrrr} -2 & 2 & 3 & -8 & -12 \\ & & -4 & 2 & 12 \\ \hline & 2 & -1 & -6 & 0 \end{array}$$

When is the remainder theorem useful?

Is $P(x)=-2x^{19}+8x^{17}-6x^{10}+x^{8}+12$ divisible by $x-2$?

$$P(2)=\overset{-1\cdot 2\cdot 2^{19}}{-2(2)^{19}}+\overset{2^3\cdot 2^{17}}{8(2)^{17}}-6(2)^{10}+2^8+12$$
$$=\cancel{-2^{20}}+\cancel{2^{20}}-6144+256+12$$
$$-5876$$

No

Is $P(x)=x^{26}-6x^{18}+3$ divisible by $x-i$

$$P(i) = i^{26} - 6i^{18} + 3$$
$$= i^{2} - 6i^{2} + 3$$
$$= -1 + 6 + 3$$
$$= 8 \qquad \text{NO}$$

Extra problems:

1) Is $P(x)=x^{99}-2x^{52}+x^{2}$ divisible by $x+1$?

2) Is $P(x)=x^{101}+3x^{20}+x^{3}$ divisible by $x-i$?

3) Find the value of k so that $(x^{2}+4x+8) \div (x-k)$ has a remainder of 4.

HW pg 290-291 1-4 all, 20-30 even & Extra problems